

US011057614B1

(12) United States Patent Eble

(10) Patent No.: US 11,057,614 B1

(45) **Date of Patent:** Jul. 6, 2021

(54) MOTION BLUR COMPENSATION THROUGH DISPLAY ACTUATION

- (71) Applicant: Apple Inc., Cupertino, CA (US)
- (72) Inventor: Tobias Eble, Sunnyvale, CA (US)
- (73) Assignee: Apple Inc., Cupertino, CA (US)
- (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35

U.S.C. 154(b) by 0 days.

- (21) Appl. No.: 16/555,279
- (22) Filed: Aug. 29, 2019

Related U.S. Application Data

- (60) Provisional application No. 62/727,093, filed on Sep. 5, 2018.
- (51) Int. Cl. H04N 13/383 (2018.01) G09G 3/20 (2006.01) H04N 13/351 (2018.01) H04N 13/344 (2018.01)
- (52) U.S. Cl.

CPC *H04N 13/383* (2018.05); *G09G 3/2018* (2013.01); *H04N 13/344* (2018.05); *H04N 13/351* (2018.05); *G09G 2320/0261* (2013.01); *G09G 2320/103* (2013.01); *G09G 2330/021* (2013.01); *G09G 2340/0435* (2013.01)

(58) Field of Classification Search

CPC .. H04N 13/383; H04N 13/344; H04N 13/351; G09G 3/2018; G09G 2320/0261; G09G 2320/103; G09G 2340/0435

See application file for complete search history.

(56) References Cited

U.S. PATENT DOCUMENTS

7,747,153	B2	6/2010	Ibaraki
7,822,330	B2	10/2010	Hasuda
8,605,008	B1	12/2013	Prest et al.
9,866,756	B2	1/2018	Nakamura
2012/0311590	A1*	12/2012	Park G06F 1/329
			718/102
2015/0084862	A1*	3/2015	Sugihara G02B 27/0179
			345/156
2015/0168722	A1*	6/2015	Cho G06F 1/1637
			345/156
2017/0358141	A1	12/2017	Stafford et al.
2018/0217380	A1*	8/2018	Nishimaki G02B 27/0176
2018/0295290	A1*	10/2018	Nakamura G06F 3/011
2018/0359463	A1*	12/2018	Mori H04N 13/344

^{*} cited by examiner

Primary Examiner — Vijay Shankar Assistant Examiner — Nathaniel P Brittingham (74) Attorney, Agent, or Firm — Thompson Hine LLP

(57) ABSTRACT

In one implementation, a method of compensating for motion blur while presenting content on a display of an electronic device through display actuation is disclosed. The method involves detecting movement of the electronic device using a sensor of the electronic device while presenting content on a display of the electronic device. An inter-frame movement of the electronic device is determined based on the movement of the electronic device. The display is moved using an actuator of the electronic device that is coupled to the display such that movement of the display opposes the inter-frame movement of the electronic device.

20 Claims, 6 Drawing Sheets

800

